UNITED STATES PATENT AND TRADEMARK OFFICE

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EXAMINER
KENNEDY, TIMOTHY J

ART UNIT	PAPER NUMBER
1791	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

	Application No.	Applicant(s)
	10/536,897	LARSSON, MORGAN
Office Action Summary	Examiner	Art Unit	
	TIMOTHY KENNEDY	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>13 April 2009</u>.
2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1,2,4,6,7,9,13 and 14</u> is/are pending in the application.
       4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) <u>1,2,4,6,7,9, 13, 14</u> is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
       Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
       Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
       a)☐ All   b)☐ Some * c)☐ None of:
              1.☐ Certified copies of the priority documents have been received.
              2.☐ Certified copies of the priority documents have been received in Application No. _____.
              3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
       * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5)☐ Notice of Informal Patent Application
6)☐ Other: _____.

DETAILED ACTION

Response to Amendment

1.   By way of the amendment filed 4/13/2009; claims 1, 2, 4, 6, 7, and 9 are

amended, claims 3, 5, 8, and 10-12 are cancelled, and claims 13 and 14 are new.

Claim Objections

2.   The objections to claims 4-6 and 9-12 are withdrawn due to the amendments to

the claims.

Claim Rejections - 35 USC § 112

3.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly
> claiming the subject matter which the applicant regards as his invention.

4.   Claims 1, 2, 4, 13, and 14 are rejected under 35 U.S.C. 112, second paragraph,

as being incomplete for omitting essential steps, such omission amounting to a gap

between the steps. Claims 2, 4, 13, and 14 are rejected due to their dependency. See

MPEP § 2172.01. A claim which fails to interrelate essential elements of the invention

as defined by applicant(s) in the specification may be rejected under 35 U.S.C. 112,

second paragraph, for failure to point out and distinctly claim the invention. See In re

Venezia, 530 F.2d 956, 189 USPQ 149 (CCPA 1976); In re Collier, 397 F.2d 1003, 158

USPQ 266 (CCPA 1968)

5.   In claim 1 there is no interrelationship between the energy balance calculation

and the remainder of the process. There is no language in claim 1 that connects the

steps of calculating, determining, and solving to a next step in the rapid prototyping

process. The same is true regarding the thermal conductivity equation.

6.   The Examiner suggests importing the limitation indicated in claim 2 into claim 1,

since the processing in claim 2 is the resultant step of the calculating, determining, and

solving. This is not an indication of allowable subject matter, but an indication of what

could easily be done to overcome this rejection under the second paragraph of 35

U.S.C. 112. However this is not true for the thermal conductivity equation, Since no

where else in the pending claims is a use disclosed for the thermal conductivity

equation.

7.   Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite

for failing to particularly point out and distinctly claim the subject matter which applicant

regards as the invention.

8.   It is unclear as to how a temperature distribution can be stationary and in what

direction that the temperature distribution is stationary. Does this mean that the

distribution is linear with a slope, or linear with a slope of zero? Clarification is

requested.

Claim Rejections - 35 USC § 103

9.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

10.   The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

      1.   Determining the scope and contents of the prior art.

      2.   Ascertaining the differences between the prior art and the claims at issue.

      3.   Resolving the level of ordinary skill in the pertinent art.

      4.   Considering objective evidence present in the application indicating obviousness or nonobviousness.

11.   Claims 1, 2, 6, 7, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andersson et al (WO 01/81031; from previous Office Action).

Regarding claim 1:

12.   A method for production of three-dimensional bodies by successive fusing together of selected areas of a powder bed, which parts correspond to successive cross sections of the three-dimensional body (page 16, lines 27-30)

13.   Applying a powder layer to a work table (page 16, line 31)

14.   Fusing said powder layer by supplying energy from a radiation gun according to an operating scheme determined for the powder layer to said selected area within the powder layer such that the powder in said selected area is fused into a cross section of said three-dimensional body (page 16, lines 32-33 – page 17, lines 1-3)

15.   Further regarding claim 1:

16.   Calculating an energy balance for said selected area

17.   Said calculating including determining whether energy radiated into the selected area is sufficient to maintain a defined working temperature of the selected area

18.   Solving a thermal conductivity equation for a given temperature distribution of the selected area.

19.   Applicant discloses that the energy balance can be calculated using any or all of the following parameters: total area of the part area; total volume of the part area; total

length of the edge of the part area; ambient temperature of the powder layer;

temperature of the top powder layer; temperature in a fused-together area within the

selected area in the top layer; desired surface temperature of the fused- together

selected area; temperature at the bottom of the three-dimensional body; temperature in

the upper surface of the three-dimensional body; temperature of the three-dimensional

body before energy is supplied to the selected area in the top layer, [which is referenced

for understanding and not for incorporating unclaimed features.]

20.   Andersson et al disclose the use of a camera for sensing the temperature

distribution of a surface layer on the powder bed and to control the temperature

distribution based on the observed temperature distribution (page 8, lines 27 through

page 9, line 5), but does not directly disclose an energy balance equation for

determining the needed working temperature nor solving a thermal conductivity

equation.

21.   However, it would have been obvious to one having ordinary skill in the art at the

time the invention as made that the temperature distribution information from the

camera is used in a calculation to determine how the temperature distribution needs

altered based on the energy input from the radiation gun. Thus an energy balance

equation is implied by the alteration of the temperature distribution form the temperature

distribution data gained from the camera. Furthermore one having ordinary skill in the

art would understand that thermal conductivity would play a factor in the alteration of the

temperature distribution since thermal energy would be escaping from the active area,

thus the need for the camera to sense changes in the temperature distribution and thus also the need to alter the temperature distribution if need be.

22.   Regarding claim 2:

23.   Where said supplying energy from a radiation gun also includes heating the selected area to a defined working temperature if the calculated energy balance indicates there is insufficient energy to maintain the selected area at said defined working temperature

24.   As mentioned previously the temperature distribution sensing camera of Andersson et al would inherently sense the temperature of the selected area, and thus when altering the temperature distribution would also maintain the selected area at the proper temperature based off the calculation as previously discussed.

25.   Regarding claim 6, Andersson et al teaches:

26.   A work table on which said three-dimensional product is built up (page 14, lines 5-6)

27.   A powder dispenser that distributes a thin layer of powder on the work table, thereby forming a powder bed (page 14, lines 6-7)

28.   A radiation gun that fuses the powder together by delivering energy thereto (page 14, lines 6-7)

29.   A beam guide that guides the beam emitted by the radiation gun over said powder bed such that the beam forms a cross section of said three- dimensional product by fusing together parts of said powder bed (page 14, liens 8-10)

30.   A control computer which stores information about successive cross sections of

the three-dimensional product, which cross sections build up the three-dimensional

product, controls the beam guide according to an operating scheme (page 14, liens 10-

18)

31.   Further regarding claim 6:

32.   Calculates an energy balance for at least one part area within each powder layer,

by determining whether energy radiated into the part area is sufficient to maintain a

defined working temperature of the part area and solving a thermal conductivity

equation for a given temperature distribution of the part area.

33.   Applicant discloses that the energy balance can be calculated using any or all of

the following parameters: total area of the part area; total volume of the part area; total

length of the edge of the part area; ambient temperature of the powder layer;

temperature of the top powder layer; temperature in a fused-together area within the

selected area in the top layer; desired surface temperature of the fused- together

selected area; temperature at the bottom of the three-dimensional body; temperature in

the upper surface of the three-dimensional body; temperature of the three-dimensional

body before energy is supplied to the selected area in the top layer, [which is referenced

for understanding and not for incorporating unclaimed features.]

34.   Andersson et al disclose the use of a camera for sensing the temperature

distribution of a surface layer on the powder bed and to control the temperature

distribution based on the observed temperature distribution (page 8, lines 27 through

page 9, line 5), but does not directly disclose an energy balance equation for

determining the needed working temperature nor solving a thermal conductivity

equation.

35.   However, it would have been obvious to one having ordinary skill in the art at the

time the invention as made that the temperature distribution information from the

camera is used in a calculation to determine how the temperature distribution needs

altered based on the energy input from the radiation gun. Thus an energy balance

equation is implied by the alteration of the temperature distribution form the temperature

distribution data gained from the camera. Furthermore one having ordinary skill in the

art would understand that thermal conductivity would play a factor in the alteration of the

temperature distribution since thermal energy would be escaping from the active area,

thus the need for the camera to sense changes in the temperature distribution and thus

also the need to alter the temperature distribution if need be.

36.   Regarding claim 7:

37.   Where the control computer controls the beam guide according to the operating

scheme, such that, in addition to said energy for fusing together powder layers (page

14, liens 10-18), the radiation gun delivers energy for heating the powder layer to a

defined working temperature if the calculated energy balance indicates there is

insufficient energy to maintain the selected area at said defined working temperature

(See remarks regarding claim 2)

38.   Regarding claim 13:

39.   Said calculating energy balance includes assuming that the entire selected area

has the same temperature

40.   Andersson et al do not explicitly state that an assumption is made that the entire

selected are has the same temperature. However this would have been an obvious

assumption to one having ordinary skill in the art at the time the invention was made

since in order for there to be complete fusion of the powder across the entire selected

area the entire area would have to have the same temperature at some point during the

process. Add in the fact that the temperature distribution process as discussed with

regards to claims 1 and 6 would make this possible since for the entire selected area

would have the same temperature thus the temperature distribution process could

maintain the selected area at the same temperature.

41.   Regarding claim 14:

42.   Said calculating an energy balance includes assuming that the temperature

distribution during fusion is stationary

43.   Andersson et al do not explicitly state that an assumption is made regarding the

temperature distribution being stationary. However this would have been an obvious

assumption to one having ordinary skill in the art at the time the invention was made

since a skilled artisan would not want the temperature distribution around the selected

area to change during the fusing process since this would alter the final three-

dimensional product. Add in the fact that the temperature distribution process as

discussed with regards to claims 1 and 6 would make this possible since the

temperature distribution can be altered based on the output of the radiation source and

the data gained from the camera, as previously discussed.

44.   Claims 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Andersson et al, in view of Beaman et al (U.S. Patent 5,352,405). Regarding claim 4:

45.   As previously discussed Andersson et al teach the energy balance calculation for

maintaining the selected area at the proper temperature, but does not teach:

46.   Dividing the selected area into a set of separate areas

47.   Calculating an energy for each of said separate areas

48.   Determining whether there is sufficient energy to maintain the selected area at

said defined working temperature by summing the energies of said separate areas

49.   In the same field of endeavor Beaman et al teach dividing the selected area into

separate areas (Figure 7). Furthermore Beaman et al teach the laser power can altered

according to the shape of the smaller separate areas, which in turn produces less

thermal vibrations and improves the structural uniformity of the part. (column 11, lines

45-58).

50.   It would have been obvious to one having ordinary skill in the art at the time the

invention was made to combine the calculations of Andersson et al with the smaller

separate areas of Beaman et al, since doing so improves both the thermal variations

during production, and the final part. Thus making the needed calculations involve the

summation of the total number of separate areas.

51.   Regarding claim 9:

52.   See remarks regarding claim 4.

Double Patenting

53.   The Double Patenting rejections from the previous Office Action are withdrawn

due to the amendments to the claims, and the improper nature of the previous Double

Patenting rejection.

Response to Arguments

54.   Applicant's arguments with respect to claims 1 and 6 filed 4/13/2009 have been

considered but are moot in view of the new ground(s) of rejection.

55.   Applicants arguments regarding claims 1 and 6 center around the difference

between the instant invention's claim of "calculating" versus the "sensing" of Andersson

et al.

56.   The Examiner would like to point out that the previous use of the energy equation

$H = Cp*m*\Delta T$ was indeed improper, as pointed out by the Applicant, since the H

equation is used for closed systems; compared to the open system of the instant

invention.

57.   However, based on further evidence from Andersson et al, and the amendments

to the claims the Examiner does not find the Applicant's argument persuasive. This is

due to the fact that the "sensing" of Andersson et al inherently involves a calculation.

Andersson et al senses the temperature distribution of the selected area, and uses that

data to alter the temperature distribution of the selected area by altering the output from

the radiation source (ass discussed in the above Office Action).

58.   A skilled artisan would understand that the calculation involved in controlling the

temperature distribution of the selected area would involve balancing the energy

outputs/inputs, knowing the thermal conductivity, and knowing how much alteration is

need to the radiation source output to correct any needed temperature distributions in

the part. Since the temperature distribution of the selected area is affected by the

energy input/output from the surrounding area and the radiation source, and thermal

conductivity of the area.

59.   The Examiner would like to point out that the language used in claims 1 and 6

does not preclude the use of a feed back loop system (which is essentially what

Andersson et al uses) to create a calculation based on temperature distribution sensor

data. It is noted that the features upon which applicant relies (i.e., the use of a non-feed

back system: something akin to a quasi feed-forward system) are not recited in the

rejected claim(s). Although the claims are interpreted in light of the specification,

limitations from the specification are not read into the claims. See *In re Van Geuns*, 988

F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

60.   Furthermore based on the language used in claim 1 nothing is done with the

energy balance calculation, thus it could be argued that any skilled artisan could create

an energy balance equation since no end use limitation is shown in claim 1. The same

can be said of the thermal conductivity equation.

Conclusion

61.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE
MONTHS from the mailing date of this action. In the event a first reply is filed within
TWO MONTHS of the mailing date of this final action and the advisory action is not
mailed until after the end of the THREE-MONTH shortened statutory period, then the
shortened statutory period will expire on the date the advisory action is mailed, and any
extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of
the advisory action. In no event, however, will the statutory period for reply expire later
than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the
examiner should be directed to TIMOTHY KENNEDY whose telephone number is (571)
270-7068. The examiner can normally be reached on Monday to Friday 9:00am to
6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's
supervisor, Joseph Del Sole can be reached on (571) 272-1130. The fax phone
number for the organization where this application or proceeding is assigned is 571-
273-8300.

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tjk

/Joseph S. Del Sole/
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